INTERNATIONAL FOOD INFORMATION SERVICE

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FAB 17

MICROBIAL TOXINS IN FOODS

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Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES
ASSISTANT EDITOR

1

Stability of staphylococcal enterotoxin A to selected conditions encountered in foods.
Chordash, R. A.; Potter, N. N.
Journal of Food Science **41** (4) 906-909 (1976) [20 ref. En] [Dep. of Food Sci., Cornell Univ., Ithaca, New York 14853, USA]

Changes in serological activity of enterotoxin (ent.) A were measured by immunodiffusion. Reducing sugars (xylose, lactose, glucose, maltose and fructose) did not react with ent. to reduce titer under various conditions of concn., pH, temp. and time but all the sugars exhibited ent. protective effect when systems were heated at 60°C. Sodium propionate, benzoate and nitrite at various concn. did not alter ent. titer when systems were incubated ≤9 days at 21° or 37°C. Sodium sulphite at solution concn. of 1000 ppm decreased titers under specific conditions that suggest weak complex formation with ent. Luxuriant growth of bacteria (Bacillus, Micrococcus, Brevibacterium, Pseudomonas, Proteus, Escherichia, Enterobacter) and yeasts (Candida, Saccharomyces) in several media containing ent. A did not significantly alter ent. titer. Titer was substantially reduced by several lactic acid bacteria including Lactobacillus acidophilus, L. helveticus, L. plantarum, L. mesenteroides, Streptococcus thermophilus, Strep. faecalis var. liquefaciens, Strep. lactis and Pediococcus pentosaceus in MRS broth and by 5 of the species in APT broth. Reductions in titer were not simply due to decreases in pH by these organisms. Studies on heat-inactivated ent. revealed partial reactivation in phosphate-buffered saline incubated at 30° and 37°C for 72 h but not at several other conditions of lower temp. and shorter time. IFT

2

Isolation and purification of Clostridium perfringens enterotoxin by affinity chromatography.
Barnhart, H. M.; Bullerman, L. B.; Ball, E. M.; Wagner, F. W.
Journal of Food Science **41** (4) 903-905 (1976) [16 ref. En] [Dep. of Food Sci. and Tech., Univ. of Nebraska, Lincoln, Nebraska 68583, USA]

Sporulating cells of certain strains of Cl. perfringens produce an intracellular enterotoxin believed to be the causative agent of Cl. perfringens food poisoning. Rabbit antibody preparations to both vegetative and sporulating cell extracts were used to purify toxin by differential immunoaffinity chromatography. Solid phase immunoadsorbents were prepared by attaching antibody via α-amino groups to succinylaminoethyl Sepharose-4B to give 2 resins: one binding anti-vegetative immunoglobulin G (IgG) (V-resin), the other, anti-sporulating IgG (S-resin). Sporulating cell extract was passed through resin with bound IgG to vegetative cell extract. A large protein fraction representing antigens common to both Cl. perfringens forms was retained, but toxin was not measurably absorbed to the resin as determined by erythemal activity in rabbits. The toxic fraction was then passed through resin with bound IgG to sporulating cell extract. The majority of the protein did not adhere to this resin; however, that which did showed erythemal activity in rabbits. Disc-gel electrophoresis of the protein fraction eluted from resin with bound IgG to sporulating cell extract demonstrated the presence of 5 components. One elicited erythemal activity in rabbits. The max. capacity of V-resin column was 102 μg of bound protein/ml of resin, and of S-resin column, 32 μg of bound protein/ml of resin. A 150-fold purification was achieved by the procedure. Resins could be used repeatedly. IFT

3

Thermal stability of enterotoxins in food.
Tatini, S. R.
Journal of Milk and Food Technology **39** (6) 432-438 (1976) [16 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St Paul, Minnesota 55108, USA]

The thermal stability of staphylococcal enterotoxins is influenced by the nature of the food, pH and presence of NaCl etc., and the type of enterotoxin (enterotoxin A being more stable at pH 6.0 than pH 4.5-5.5, the most stable pH for enterotoxin D). It is seen that heat treatments commonly used in food processing, i.e. milk pasteurization (72°C, 15 s) or UHT treatment (290°F, 9 s) in a 'Spiratherm' unit, or smoking and heating of cured sausage to 70-100°C, or heating of Cheddar cheese to 70-90°C, are ineffective for complete destruction of enterotoxin A or D when present initially at levels normally expected to be found in foods (0.5-1.0 μg/100 ml or g). Treatment of heated enterotoxin A or D with urea and its removal by dialysis before serological assay increased the recovery of enterotoxin almost 4-fold as compared to controls which were heated and not treated with urea. In the absence of urea treatment of heated toxins in milk, both toxins were found to be inactivated (to <0.02 μg/ml) within 15 min at 121.1°C. LMB

4

Staphylococcal food poisoning in summer.
Anon.
British Medical Journal **2** (6031) 376 (1976) [En]

Probably because of the uncommonly hot weather, more outbreaks of food poisoning than usual were reported in the UK and Irish Republic in the summer of 1976. In most outbreaks there was clear evidence of poor hygiene in food preparation, usually a combination of handling cooked food and storing it unrefrigerated or inadequately refrigerated for too long a period. Several food poisoning outbreaks known to have been caused by Staphylococcus aureus during the summer of 1976 are briefly discussed. Particular reference is made to large outbreaks in schools, caused by chicken, ham or trifle; in each case the outbreaks were due to lapses in hygiene. Pork pie was the cause of an outbreak in a hospital; it had

been delivered to the hospital in an unrefrigerated van and then refrigerated for 5 days before being served. JA

5

Staphylococcal growth and enterotoxin production - factors for control. [Lecture]
Troller, J. A.
Journal of Milk and Food Technology **39** (7) 499-503 (1976) [11 ref. En] [Procter & Gamble Co., Winton Hill Tech. Cent., Cincinnati, Ohio 45224, USA]

Factors controlling growth and enterotoxin production in foods are many and varied. Under optimum conditions, generation times as low as 15 min and max. cell populations of 10^9/g attained within 12-18 h have been reported. In naturally contaminated foods, these rates of growth are seldom encountered, because various environmental factors influence growth and enterotoxin formation. Resistance to limited moisture conditions is probably the most remarkable feature of the growth of this organism. Other factors controlling growth and toxin formation are the nutritional completeness of the medium, pH, temp., inoculum size and type, and the effect of competing organisms. In addition, the potential for staphylococcal contamination from various sources must be considered when ascertaining the public health risk presented by this organism in a specific food. Ultimately, it is the sum of these factors which must concern the food hygienist and which determine the wholesomeness of foods in the market-place. AS

6

Use of the microslide technique to measure staphylococcal enterotoxin B.
Fung, D. Y. C.; Reichert, C. A.; Medwid, R. D.
Journal of Milk and Food Technology **39** (7) 486-489 (1976) [7 ref. En] [Dep. of Microbiol., Pennsylvania State Univ., University Park, Pennsylvania 16802, USA]

A procedure to quantify staphylococcal enterotoxin B by use of the microslide technique was developed. This method consists of matching toxin activity against a series of standard curves obtained with microslides. The procedure was found to be useful in quantifying unheated as well as heated and reactivated staphylococcal enterotoxin B. AS

7

Public health importance of Clostridium perfringens.
Genigeorgis, C.
Journal of the American Veterinary Medical Association **167** (9) 821-827 (1975) [66 ref. En] [Dep. of Epidemiology & Preventive Med., School of Vet. Med., Univ. of California, Davis, California 95616, USA]

Cl. perfringens is discussed under the following headings: nature of the organism; Cl. perfringens type A enterotoxin; purification and characteristics of enterotoxin; production of enterotoxin in foods; toxicity and mode of action; detection of enterotoxin and enteropathogenic strain; epidemiologic considerations; sources of Cl. perfringens; and control of Cl. perfringens-induced food poisoning. GL

8

Effect of acidification of canned tomatoes on quality and shelf life. [Review]
Powers, J. J.
CRC Critical Reviews in Food Science and Nutrition **7** (4) 371-396 (1976) [86 ref. En] [Dep. of Food Sci., Univ. of Georgia, Athens, Georgia, USA]

This review includes a discussion of the reasons why acidification of canned tomatoes is sometimes desirable from a microbiological point of view, the possible changes in the pH of tomatoes as a result of the breeding of new var., and the methods and suitable acids for acidification. Acidification does cause some minor differences in the chemical components of the canned products, but the differences appear to be inconsequential. Although can corrosion may be accelerated slightly, this again does not seem to be of practical importance. The can manufacturers recommend the same type of can whether or not tomatoes are acidified. Flavour studies almost invariably have indicated that tomatoes are as acceptable as nonacidified tomatoes at least down to pH 4.1 to 4.0. In fact, most studies show that acidified tomatoes are somewhat more acceptable. Reasons are suggested as to why outbreaks of botulism have occurred from home-canned tomatoes, although the pH appears to have been <4.5, and as to why outbreaks have not occurred commercially, although at times the pH may have approached 4.8. AS

9

[Effect of staphylococcal enterotoxins on acidifying activity of lactic acid bacteria.] Die Beeinflussung der Säureaktivität von Milchsäurebakterien durch Staphylokokkenenterotoxine.
Schwab, H.
Schweizerische Milchwirtschaftliche Forschung **5** (July) 85-89 (1976) [9 ref. De] [Abteilung Lebensmittelkontrolle, Eidgenössisches Gesundheitsamt, Bern, Switzerland]

Strains of Lactobacillus helveticus, L. lactis, L. bulgaricus, Streptococcus thermophilus and Str. lactis obtained from the Swiss Federal Dairy Research Institute were cultured in the presence or absence of 1 of 5 preparations of staphylococcal enterotoxins supplied by SERVA Feinbiochemica, Heidelberg (Federal Republic of Germany). It is concluded from tabulated results on acidity production that the toxins had an inhibitory effect, more marked with the lactobacilli than with the streptococci. The possibility of using the phenomenon for enterotoxin detection is discussed. SKK

10

[Food poisoning caused by enterotoxin D-forming staphylococci in liver sausage.]
Lebensmittelvergiftung durch Enterotoxin-D-bildende Staphylokokken in Leberwurst.
Marcy, G.; Adam, W.
Archiv für Lebensmittelhygiene **27** (3) 87-88 (1976) [1 ref. De, en]
[Medizinaluntersuchungsanstalt, Hygienisches Inst., Hamburg, Federal Republic of Germany]

An outbreak of food poisoning which occurred in Hamburg in Dec. 1975 is reported. The outbreak, which affected 3 people in one family, was thought to be caused by liver sausage which had been packaged in glass jars by a German firm and distributed to employees for Christmas. Samples of the implicated liver sausage were found to contain Staphylococcus aureus (7×10^8/g on blood agar plates); further examination revealed the presence of staphylococcal enterotoxin D. Unopened jars of liver sausage from the same firm were found to be sterile. It is suggested that the contaminated jar either received inadequate heat treatment during processing or was contaminated via a defective closure during cooling after heat treatment. JA

11

Pickled, fermented, acidified and low-acid foods. Proposed good manufacturing practices.
United States of America, Food & Drug Administration
Federal Register **41** (143, July 23) 30442-30462 (1976) [En] [Washington, DC, USA]

The potential hazard of Clostridium botulinum toxin from pickled, fermented, and acidified foods is reviewed. The Food and Drug Administration is therefore providing a detailed 'good manufacturing practice' (GMP) for these foods, which will provide a "safe pH" of ≤4.6 when thermally processed in hermetically sealed containers. CAS

12

[Simplified method for coagulase typing of Staphylococcus aureus and its routine application in the laboratory.]
Ushioda, H.; Terayama, T.; Sakai, S.; Zen-Yoji, H.
Annual Report of Tokyo Metropolitan Research Laboratory of Public Health **26** (1) 1-6 (1975) [12 ref. Ja, en] [Tokyo Metropolitan Res. Lab. of Public Health, 24-1, Hyakunincho 3 chome, Shinjuku-ku, Tokyo 160, Japan]

13

Thermal inactivation and subsequent reactivation of staphylococcal enterotoxin B in selected liquid foods.
Reichert, C. A.; Fung, D. Y. C.
Journal of Milk and Food Technology **39** (8) 516-520 (1976) [15 ref. En] [Dep. of Microbiol., Pennsylvania State Univ., University Park, Pennsylvania 16802, USA]

Thermal inactivation and reactivation kinetics of staphylococcal enterotoxin B (SEB) were studied in buffer and liquid food systems (protein hydrolysate medium, phosphate-buffered saline, brain heart infusion broth + saline, whole milk, buttermilk, beef broth and tomato soup) using 3 serological techniques: single-gel diffusion method, radioimmunoassay, microslide. Heating temp. were 80-100°C and heating times 0-5 min. Initial toxin concn. were 0.008-5 μg/ml. Inactivation of SEB was fast in the early stages of heating (60-70% activity lost during the first few min) and much slower on continued heating. With the exception of phosphate-buffered saline, reactivation of heated SEB was observed in all systems even with small initial quantities of SEB. At all temp., reactivation was generally greater with short heating times. % SEB activity in foods with initial toxin concn. of 0.008-0.01 μg/ml after heating to 100°C and reactivation at 4°C was 68 in beef broth, 6 in buttermilk, 9 in whole milk, and 7 in tomato soup; corresponding values after holding at 100°C for 5 min and reactivation at 4°C were, respectively: 59, 9, 4 and 3%. JA

14

[Pathogenic staphylococci in milk products. I. Occurrence of pathogenic staphylococci in food products and their role in the aetiology of food poisoning and of infections in man and animals.]
[Review]
Karolak, K.; Karnicka, H.; Knaut, T.
Roczniki Instytutu Przemyslu Mleczarskiego **18** (2) 39-45 (1976) [32 ref. Pl, ru, en] [Inst. Przemyslu Mleczarskiego, Oddzial w Olsztynie, Olsztyn, Poland]

15

[Pathogenic staphylococci in milk products. II. Comparison of methods for detection of pathogenic staphylococci.]
Karolak, K.; Karnicka, H.; Knaut, T.
Roczniki Instytutu Przemyslu Mleczarskiego **18** (2) 47-57 (1976) [14 ref. Pl, ru, en] [Inst. Przemyslu Mleczarskiego, Oddzial w Olsztynie, Olsztyn, Poland]

The (i) Baird-Parker [Journal of Applied Bacteriology (1962) **25**, 12] and (ii) Sinel & Baumgart [Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Abteilung I Originale (1967) **204**, 248] methods were compared. (i) was found to give more precise results, but (ii) is considered to give a more clear-cut morphological picture of Staph. aureus as a suspected pathogen, and offers better prospects of its direct identification without confirmation by biochemical tests. (ii) is therefore preferred for routine tests, and (i) is preferred as a research and reference method. SKK

16

[Pathogenic staphylococci in milk products. III. Occurrence of pathogenic staphylococci during twarog manufacture.]
Karolak, K.; Karnicka, H.; Knaut, T.
Roczniki Instytutu Przemyslu Mleczarskiego **18** (2) 59-65 (1976) [12 ref. Pl, ru, en] [Inst. Przemyslu Mleczarskiego, Oddzial w Olsztynie, Olsztyn, Poland]

Samples of (i) raw milk, (ii) pasteurized milk and (iii) cheese milk for twarog manufacture and of (iv) twarog obtained during July 1971-June 1972 from a dairy factory in Olsztyn province were examined for presence of pathogenic staphylococci by the Baird-Parker method [see preceding abstr.]. Pathogenic staphylococci were detected in 18 of 20 (i) samples; none of 20 (ii) samples immediately after pasteurization, and 1 (ii) sample after re-incubation at 37°C for 24 h; 5 of 20 (iii) samples (3 among 5 summer samples and 2 among 5 spring samples); and 5 of 20 (iv) samples (distributed as for (iii)). SKK

17

Enterotoxigenicity and phage typing of staphylococci isolated from Pedha.
Kamat, M.; Sulebele, G.
Journal of Food Science and Technology, India **12** (6) 316-317 (1975) [16 ref. En] [Food & Fermentation Tech., Univ. Dep. of Chem. Tech., Bombay-400019, India]

Staphylococci isolated from samples of Pedha (the basic ingredient of which is khoa) were examined for their ability to produce enterotoxin, and phage typed. 3 of the 4 coagulase-positive strains examined were enterotoxigenic, while 1 coagulase-positive strain failed to produce any enterotoxin. 7 of the 14 isolates were phage-typable, mostly by phages belonging to groups II and III suggesting the likely source of contamination to be of human origin. AS

18

[Influence of heat treatment and addition of glycine on the production of Clostridium botulinum toxin in casing kamaboko.]
Sasajima, M.; Shiba, M.; Arai, K.; Yokoseki, M.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] **42** (4) 469-477 (1976) [18 ref. Ja, en] [Tokai Regional Fishery Res. Lab., Kachidoki 5-5-1, Chuo-ku, Tokyo, Japan]

Growth of various types of botulinal spores which were heat treated at various temp. and inoculated into cooked meat broth containing various concn. of glycine was studied. The toxin produced by spores of Clostridium botulinum type A in casing kamaboko containing various concn. of glycine was also studied. Growth of botulinal spores of types A, B, E and F after heat treatment varied with type and spore concn. The inhibitory effect of glycine on growth varied depending on the temp. of heat treatment and type and concn. of spores. Survival rates of the various spore types after heat treatment were highest in type A followed by type B, but the relation between survival rate and spore concn. was indistinct. Addition of glycine to casing kamaboko inoculated with spores of C. botulinum type A strain 190, and stored at 30°C for 4 wk appeared effectively to retard toxin production when the spore content was $<10^2$/g kamaboko. Generally, putrefaction of kamaboko seems to precede the detection of botulinal toxin. In conclusion, it is necessary to store casing kamaboko at low temp., as indicated in the new notification issued by the Ministry of Health and Welfare, Japan, when casing kamaboko is boiled under atmospheric pressure without a highly effective fungicide like furylfuramide, and stored for a long period. AS

19

Defined conditions for synthesis of Bacillus cereus enterotoxin by fermenter-grown cultures.
Glatz, B. A.; Goepfert, J. M.
Applied and Environmental Microbiology **32** (3) 400-404 (1976) [11 ref. En] [Food Res. Inst., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Detn. of the optimal conditions for enterotoxin synthesis in laboratory media could shed light on the conditions required for enterotoxin production in food products. A strain of B. cereus produced high levels of enterotoxin when grown in a semi-defined medium in a laboratory-scale fermenter. The optimum conditions for enterotoxin synthesis by cultures grown in this medium, which contained Casamino Acids and yeast extract, were found to be: inoculation of vigorously growing culture at the 1% level, addition of glucose at a concn. of 1%, control of culture pH at 8.0, incubation at 32°C, use of a moderate stirring rate, and addition of air at low flow rates to minimize foaming. The enterotoxin yield in fermenter-grown cultures was approx. 20-50 times higher than the yield obtained in shake flask cultures. AS

20

[Natural toxic materials in foods.]
Bruce, A.
Var Foeda **28** (6/7) 149-155 (1976) [14 ref. Sv, en] [Statens Livsmedelsverk, 751 26 Uppsala, Sweden]

Numerous toxic substances (of natural origin) occurring in foods are discussed, including: enzyme inhibitors; hormones and other substances with hormonal activity; vitamin antagonists; carcinogens; alkaloids; saponins; haemagglutinins; lathyrogens; allergens; compounds inhibiting nutrient absorption; and other poisons, e.g. HCN and oxalic acid. The distribution of toxic materials in various classes of foods is also discussed. AJDW

21

[Multiplication of staphylococci and formation of type A enterotoxin in cooked pasta products.]
Petrushina, L. I.
Voprosy Pitaniya No. 5, 61-64 (1976) [7 ref. Ru, en] [Inst. Pitaniya AMN SSSR, Moscow, USSR]

Cooked vermicelli was inoculated with 5×10^3 or 1×10^6/g cells of pathogenic Staphylococcus aureus 3778; the lower inoculum corresponded with the level of infection that could be expected during preparation of the product. The samples were incubated at 37°C (optimum growth temp. of organism) and 25°C (average summer temp.). Graphs were plotted of the log of the Staph. aureus cell count and presence of enterotoxin against incubation time (up to 42 h). The time taken for the enterotoxin to form was dependent on the initial inoculum, ranging from 4 h at 37°C and 1×10^6/g (when the cell count had reached 9.5×10^6/g) to >16 h at 25°C and 5×10^3/g (when the cell count had reached 1×10^8/g). HBr

22

Food poisoning in hotel visitors.
Anon.
British Medical Journal **2** (6047) 1333 (1976) [En]

A series of food poisoning outbreaks among persons who had stayed at the same hotel in Devon is reported and discussed. The outbreaks followed the consumption of various meat dishes served with gravy. Symptoms included abdominal pain, diarrhoea and vomiting. Faecal specimens from many of those affected and from 5 of 15 kitchen staff at the hotel yielded heat-resistant, non-haemolytic Clostridium welchii, the predominant serotype being 4, xiv. This serotype has been responsible for about 30% of outbreaks of Cl. welchii food poisoning investigated at the Food Hygiene Laboratory (Colindale, UK) since 1973. A number of outbreaks in one hotel indicates deficiencies in the preparation and storage of cooked food. It is suggested that a common food or ingredient, possibly gravy or stock, was responsible. JA

23

[A further two outbreaks of food poisoning aboard airliners on intercontinental flights.]
Mossel, D. A. A.
Voeding **37** (12) 701-702 (1976) [3 ref. Nl]

A brief account is given of 2 outbreaks of food poisoning aboard airliners: an outbreak involving 290 passengers and crew, attributed to hors d'oeuvres contaminated with Salmonella brandenburg by a cook who had recently suffered from gastroenteritis; and an outbreak of Staphylococcus aureus poisoning involving 24 passengers, attributed to chocolate puddings which had been held at ambient temp. for 10 h. AJDW

24

Growth and toxin production by Clostridium botulinum in moldy tomato juice.
Huhtanen, C. N.; Naghski, J.; Custer, C. S.; Russell, R. W.
Applied and Environmental Microbiology **32** (5) 711-715 (1976) [14 ref. En] [E. Regional Res. Cent., Philadelphia, Pennsylvania 19118, USA]

Tomato juice inoculated with Cladosporium sp. or Penicillium sp. developed pH gradients with the upper portions near the mould mats having pH values near neutrality and the lower portions remaining more acid. Cl. botulinum spores in these mouldy tomato juices germinated, grew out, and produced toxin. AS

25

[Clostridium species in the meat and internal organs of diseased or injured pigs.]
Sluzewski, R.
Medycyna Weterynaryjna **32** (3) 174-176 (1976) [23 ref. Pl] [Katedra Higieny Produktow Zwierzecych Wydzialu Weterynaryjnego AR, Lublin, Poland]

340 samples of leg meat, lymph nodes, kidney, spleen, liver, and gut contents were obtained from 60 pigs after emergency slaughter. Clostridia were detected in 73 (21.4%) of the 340 samples, with 8.2% containing $\leqslant 10$ clostridia/g, 5.3% containing $\leqslant 100$/g, 4.7% containing $\leqslant 1000$/g, and 3.2% containing $\leqslant 10\,000$/g. Cl. perfringens was isolated from 67% of the positive samples, Cl. bifermentans from 13%, Cl. sporogenes from 7%, Cl. sordelli from 3.6%, Cl. septicum from 2.4%, and no identification was obtained in 7%. Spores of 3 of the 57 Cl. perfringens strains isolated withstood heat treatment at 100°C for 120 min. SKK

26

[Endospore germination and growth of Clostridium botulinum B in selected canned meat and meat/vegetable products.]
Mierzejewski, J.; Skoczek, A.
Przemysl Spozywczy **30** (8/9) 303-305 (1976) [5 ref. Pl, ru, en, fr, de] [Wojskowy Osrodek Naukowo-Badawczy Sluzby Weterynaryjnej, Pulawy, Poland]

6 day-cultures of strain 1162 (State Institute of Hygiene, Warsaw, Poland) of Cl. botulinum B were treated with lysozyme and trypsin [Walker & Batty, Journal of Applied Bacteriology (1964) **27** (1) 137] and 10^8 separated endospores were inoculated into 10 ml samples of aqueous extracts of canned products or introduced into cans, the entry hole being soldered thereafter. The canned products studied were (i) cabbage soup with smoked bacon, (ii) 'bigos' (beef and pork stewed in sauerkraut), (iii) meat balls in tomato sauce, (iv) sausage with cabbage, (v) paprika pork goulash, (vi) beef goulash in Hungarian sauce, (vii) meat and vegetable risotto, (viii) pork goulash in Hungarian sauce, (ix) stuffed cabbage leaves in tomato sauce, (x) minced beef in tomato sauce, (xi) meat with

peas, (xii) forcemeat balls in tomato sauce, and (xiii) minced pork in tomato sauce. Germination index, time of appearance of 50% germinated spores, pH of extracts and can contents, and appearance of can blowing at 30°, 20°, or 10°C are tabulated. The germination index increased progressively in the stated order of products, (i) being the most resistant (index, 37.2) and being followed by (ii)-(iv) (index, 41.6-42.4). (v)-(ix) had an index <50 (46.5-49.7); and (x)-(xiii) were the most susceptible (index, 53.4-60.2). Blowing rates followed broadly the same pattern. SKK

27

Dynamics of spore germination and the development of Clostridium botulinum type B in canned meat and meat-vegetable preserves.
[Lecture]
Mierzejewski, J.
Proceedings of the European Meeting of Meat Research Workers No. 21, 66 (1975) [5 ref. En]
[Res. Cent. of Vet. Service, Pulawy, Poland]

A brief account is given of studies on germination and growth of Clostridium botulinum type B in artificially-contaminated canned meat products and meat/vegetable products. Results differed considerably between the products tested; pork or meat balls in tomato sauce supported excellent growth of Cl. botulinum, whereas cabbage soup with smoked bacon and sausage in sauerkraut showed inhibitory activity. Low pH was generally related to inhibitory effect, but some relatively high-pH products were inhibitory. A possible stimulatory effect of tomato juice on growth of Cl. botulinum is briefly considered. [See FSTA (1977) 9 4S605.] AJDW

28

Epidemiology: Food poisoning from canned pork.
Anon.
British Medical Journal 2 (6049) 1456 (1976) [En]

A brief account is given of an outbreak of violent Staphylococcus aureus poisoning (involving 2 people), attributed to canned chopped pork imported from Poland. The meat was found to contain 6.0×10^7 Staph. aureus/g. Other cans from the same factory also contained Staph. aureus strains, which formed enterotoxins A and C. Examination of the cans showed severe seaming defects; no more products from this factory are to be imported until canning standards are improved. AJDW

29

Comparison of different purification procedures for extraction of staphylococcal enterotoxin A from foods.
Niskanen, A.; Lindroth, S.
Applied and Environmental Microbiology 32 (4) 455-464 (1976) [25 ref. En] [Food Res. Lab., Tech. Res. Cent. of Finland, SF-02150 Espoo 15, Finland]

Different procedures commonly used for extraction, purification, and concn. of staphylococcal enterotoxins from foods were investigated with ^{131}I- and ^{125}I-labelled staphylococcal enterotoxin A. Loss of labelled enterotoxin A was compared with loss of total N. The results showed that in most of the common procedures, such as gel filtration, ion exchange, and heat treatment, the % loss of labelled enterotoxin A was greater than the loss of total N. Chloroform extraction and acid precipitation with HCl had nearly the same effect on the purification of both labelled enterotoxin A and total N. Ammonium sulphate precipitation proved to be practical and was successfully used for purification of enterotoxin A from sausage extract. Simultaneous use of trypsin and Pseudomonas peptidase for treatment of food extracts considerably reduced food proteins capable of interfering with serological detection of enterotoxins but did not essentially influence the loss of enterotoxin A. AS

30

Food poisoning outbreak attributed to Bacillus cereus.
Schmitt, N.; Bowmer, E. J.; Willoughby, B. A.
Canadian Journal of Public Health 67 (5) 418-422 (1976) [22 ref. En, fr] [W. Kootenay Health Unit, 1325 McQuarrie Street, Trail, British Columbia V1R 1X2, Canada]

About 300 of 450 people who attended a dinner in Trail, British Columbia, subsequently developed diarrhoea and abdominal cramps. Heavy growth of an aerobic, gram-positive, spore-forming bacillus resembling B. cereus was recovered from remnants of a green bean salad served at the dinner. The characteristics of the illness in this outbreak closely resembled those observed in food-poisoning incidents attributed to B. cereus in Europe and the USA, but differed from those reported in Quebec and the UK and attributed to fried rice. AS

31

Serotypes of Bacillus cereus from outbreaks of food poisoning and from routine foods.
Gilbert, R. J.; Parry, J. M.
Journal of Hygiene 78 (1) 69-74 (1977) [20 ref. En] [Food Hygiene Lab., Cent. Public Health Lab., Colindale Avenue, London NW9 5HT, UK]

A provisional serotyping scheme was used to type cultures of B. cereus from 84 outbreaks of food poisoning in 7 countries; 283 of the 337 cultures tested were typable. In 35 of the 61 outbreaks associated with a vomiting-type syndrome, foods, clinical specimens or both yielded H-serotype 1 only. Type 1 strains together with other serotypes were isolated in 7 outbreaks. In 14 outbreaks, types 3, 4, 5, 8 or a mixture of serotypes were present. Untypable strains were isolated in 5 outbreaks. 2 of the 9 diarrhoeal-type outbreaks yielded serotype 1 only. Types 2, 6, 8, 9, 10 and a mixture of type 12 and an untypable strain appeared to be responsible for 1 outbreak each. Although 16 of the 18 recognised serotypes were present among cultures of B. cereus from various routine foods, only 156 of the 400 isolates tested were typable. AS

32

Catalase: its effect on microbial enumeration.
Martin, S. E.; Flowers, R. S.; Ordal, Z. J.
Applied and Environmental Microbiology 32 (5) 731-734 (1976) [19 ref. En] [Dep. of Food Sci., Univ. of Illinois, Urbana, Illinois 61801, USA]

The addition of catalase to the surface of selective medium plates permitted increased enumeration of physically or chemically injured microorganisms. Catalase acted by preventing the accumulation of H_2O_2 in, or around, injured cells. Heat-injured Staphylococcus aureus cells had decreased catalase activity, and heat-inactivated catalase had no effect on enumeration. [See also FSTA (1976) 8 8C366.] AS

33

[Media for enterotoxin production and sporulation by Clostridium perfringens.]
Gyobu, Y.; Kodama, H.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 17 (3) 219-226 (1976) [19 ref. Ja, en] [Toyama Inst. of Health, Otemachi 1, Toyama-shi, Japan]

34

Food microbiology: public health and spoilage aspects. [Book]
Defigueiredo, M. P.; Splittstoesser, D. F. (Editors) ix + 492pp. ISBN 0-87055-209-0 (1976) [many ref. En] Westport, Connecticut, USA; AVI Publishing Co. Inc. Price $35.00 (US), $36.00 (Foreign) [Nat. Portion Control, Chicago, Illinois, USA]

The objective of this book is to provide information on microorganisms causing food poisoning or spoilage. Special emphasis is placed on the habitats of the organisms, bases for their recognition, and factors affecting their growth and death in foods. Chapters are: Statistics in microbiological control, by F. R. Smith (pp. 1-11, 9 ref.); Staphylococcus aureus, by F. L. Bryan (pp. 12-128, many ref.); Salmonella and Shigella, by J. A. Troller (pp. 129-155, 38 ref.); Clostridium botulinum, by R. B. Tompkin & L. N. Christiansen (pp. 156-169, 38 ref.); Clostridium perfringens, by C. L. Duncan (pp. 170-197, 56 ref.); Vibrio parahaemolyticus, by J. Liston (pp. 198-209, 16 ref.); Toxigenic fungi, by E. H. Marth & B. G. Calanog (pp. 210-256, many ref.); Viruses, by D. O. Cliver (pp. 257-270, 32 ref.); Coliforms, enterococci and other microbial indicators, by M. P. Defigueiredo & J. M. Jay (pp. 271-297, many ref.); Gram-positive nonspore-forming rods, by A. A. Kraft (pp. 298-336, 99 ref.); Gram-negative nonspore-forming rods, by D. F. Splittstoesser (pp. 337-355, 54 ref.); Aerobic and anaerobic spore-forming bacteria and food spoilage, by H. W. Walker (pp. 356-386, many ref.); Micrococci, by H. B. Naylor (pp. 387-403, 37 ref.); Lactic acid bacteria, by J. R. Stamer (pp. 404-426, 72 ref.); Yeasts, by H. J. Peppler (pp. 427-454, many ref.); and Moulds, by D. F. Splittstoesser & D. B. Prest (pp. 455-479, 64 ref.). JA

35

[Bacterial food poisoning.] Bakterielle Lebensmittelvergiftungen. [Lecture]
Weber, G.
L und E 29 (6) 154-156; (7) 181-183 (1976) [15 ref. De, en] [Hygiene-Inst., Univ., Kinderspitalgasse 15, A-1095 Vienna, Austria]

This review describes the clinical symptoms and epidemiology of bacterial food poisoning, especially that caused by salmonellae, staphylococci and Clostridium botulinum. Some case histories are reported illustrating the spread of intoxications, especially in institutional feeding. Preventive measures recommended include provision of uncontaminated raw material, continuous control of hygiene and cold chain for perishable foods. RM

36

The incidence of Clostridium botulinum in farmed trout raised in Great Britain.
Cann, D. C.; Taylor, L. Y.; Hobbs, G.
Journal of Applied Bacteriology 39 (3) 331-336 (1975) [21 ref. En] [Torry Res. Sta., 135 Abbey Road, Aberdeen AB9 8DG, UK]

A total of 1400 rainbow trout (Salmo gairdneri) from 17 trout farms in the UK was tested for Clostridium botulinum during a 2-yr period starting in late 1972. A table is given showing the incidence and type of Cl. botulinum in whole fish and in viscera, for each farm studied. Overall, 9.4% of whole fish samples and 11.0% of viscera samples were Cl. botulinum-positive. Fish from 4 farms were free from Cl. botulinum; 100% of fish from one farm were Cl. botulinum-positive. Little seasonal effect on the incidence of Cl. botulinum was observed in repeated studies at 1 farm. Cl. botulinum types B, C, E and F were detected. Toxin titres in incubated fish or in broth cultures were relatively low. The possible health hazard from Cl. botulinum-containing fish, especially products (e.g. smoked trout) eaten without further cooking, is discussed. AJDW

37

Processed meats. [Lecture]
Ayres, J. C.
Proceedings of the Meat Industry Research Conference pp. 103-113 (1975) [9 ref. En] [Dep. of Food Sci., Univ. of Georgia, Athens, Georgia 30602, USA]

The organisms responsible for spoilage and food-borne disease mediated by processed meats are described, with the effects of various processing variables on the microbial flora. The main health hazards arise from Clostridium perfringens, staphylococci, salmonellae and Cl. botulinum. [See FSTA (1977) 9 5S845.] JRR

38

Coagulase positive staphylococci from slaughter house meat at Calcutta.
Gupta, P. D.; Choudhury, S. P. C.
Indian Journal of Microbiology 15 (2) 62-63 (1975) [9 ref. En] [Vet. Res. Organization, 37 Belgachia Road, Calcutta 37, India]

Samples of intestine, lymph node, liver and muscle were obtained from carcasses of buffaloes, goats, pigs and poultry. The carcasses had been obtained from slaughterhouses and retail outlets in Calcutta. The samples were examined for coagulase-positive staphylococci. Number of samples giving positive results and total number of samples examined were, respectively: 44 and 1020 for buffaloes, 31 and 585 for goats, 12 and 391 for pigs, and 14 and 648 for poultry. Coagulase-positive staphylocicci were isolated from 17 of 247 samples of buffalo muscle, from 14 of 257 samples of goat muscle, and from 8 of 71 samples of pig muscle; poultry muscle was not examined. JA

39

[Production of staphylococcal anti-enterotoxic serum type B for serotyping of staphylococci.]
Bugrova, V. I.; Fluer, F. S.
Voprosy Pitaniya No. 1, 61-63 (1977) [5 ref. Ru, en] [Inst. Pitaniya AMN SSSR, Moscow, USSR]

Following immunization of rabbits with a purified preparation of type B staphylococcal enterotoxin a diagnostic staphylococcal antiserum for detection of enterotoxin in vitro in food products and in staphylococcal strains isolated from cases of staphylococcal food poisoning was obtained. In gel diffusion reactions the type B enterotoxic antiserum was identical to the antiserum of the same type produced in England. AS

40

[Clostridium botulinum - a real problem for the food industry?]
Danielsson, M.-L.; Fabianson, S.
Svensk Veterinartidning 28 (21) 961-966 (1976) [16 ref. Sv] [Inst. för Livsmedelshygien, Roslagsvägen 101, 104 05 Stockholm 50, Sweden]

The significance of Cl. botulinum as a health hazard in foods is discussed, with reference to: historical aspects; characteristics of the main serotypes of Cl. botulinum; botulinum in man (incubation time, symptome, treatment); the ecology of Cl. botulinum; factors influencing growth of Cl. botulinum in foods (pH, water activity, temp., acidity, nitrite, other microorganisms); the heat-resistance of Cl. botulinum spores; and detn. of Cl. botulinum and its toxin. AJDW

41

[Bacteriological examination of canned fish contaminated with Clostridium botulinum E after storage for 3 years.]
Skoczek, A.; Matras, J.
Medycyna Weterynaryjna 32 (12) 754-756 (1976) [13 ref. Pl, ru, en] [ul. Czartoryskich 13/14, 24-100 Pulawy, Poland]

100 commercial cans (size not stated) of fish titbits in mustard sauce, mackerel fillets in onion sauce and herring in tomato sauce were each contaminated with 10^8 spores of Cl. botulinum E No. 1169 from the collection of the State Institute of Hygiene (Warsaw, Poland), sealed by soldering, stored for 3 yr under 'thermolabile' conditions, and examined biologically for toxicity and bacteriologically by (i) culturing, (ii) immunofluorescence, and (iii) agar gel precipitation test. All cans showed blowing 10 days after contamination. 66% of the can contents proved toxic when tested directly and 52% proved toxic after isolation of Cl. botulinum in pure culture. 94% proved positive for Cl. botulinum growth by (i) after culturing for 24 h, and 97% proved positive after culturing for 27 h; 91% gave a positive (ii) test, and 88% gave a positive (iii) test. SKK

42

Simplified thermonuclease test for rapid identification of Staphylococcus aureus recovered on agar media.
Lachica, R. V. F.
Applied and Environmental Microbiology 32 (4) 633-634 (1976) [10 ref. En] [Unified Food Control Lab., Inst. of Nutr. of Cent. America & Panama, Guatemala City, Guatemala]

The detection of thermonuclease activity was done by the colony overlay procedure using toluidine blue ≡ O-deoxyribonucleic acid-agar (TDA) medium. Preheated (2 h at 60° C) plates with grown colonies were overlaid with 10 ml of molten TDA. A Staph. aureus colony was identified by a bright pink zone after 3 h at 37° C. The method is referred to as the simplified thermonuclease (STN) test. When 4 naturally contaminated food samples (ham, a frankfurter and 2 cheeses) were examined by the surface plating technique, STN facilitated the identification of every Staph. aureus colony in each countable plate of Baird-Parker medium, tellurite-glycine agar and egg yolk-sodium azide agar. The results indicate that the STN is quick, cheap and an improvement over the tube coagulase and thermonuclease tests in identifying Staph. aureus from food. LMB

43

Evaluation of a capillary tube immunodiffusion method and an improved cooked meat medium for detection of Clostridium botulinum in foods.
Guilfoyle, D.; Quagliaro, D.; Mestrandrea, L.
Abstracts of the Annual Meeting of the American Society for Microbiology 76, 188 (1976) [En] [FDA, Brooklyn, New York, USA]

A micro-capillary agar-gel immunodiffusion method was used to assay for Cl. botulinum toxin in various canned foods. The min. toxin concn. detectable by the method were determined. The lowest titres detected varied with product type and toxin type. With type F toxin, 0.1 MLD (min. lethal

dose)/ml was detectable in liquid from both string beans and pimentos; 2.5 MLD/ml in mushroom liquid. Considerably higher min. titres were detected with type A (25 MLD/ml from mushroom and 50 MLD/ml from tuna). The capillary method was used successfully for rapid identification of botulinal toxin in suspected foods. Type E was found in a home-cured fish product and type C in canned tuna. Both were confirmed by mouse bioassay. Addition of cooked meat particles to fluid thioglycolate broth has facilitated cultural identification of Cl. botulinum. Growth and toxin production are more rapid than with the cooked meat medium. In addition, proteolysis reactions can be determined distinctly in 24-36 h as compared to 72-96 h for cooked meat. AS

44

Production and stability of hemolysin, phospholipase C, and lethal toxin of Bacillus cereus in foods.
Ivers, J. T.; Potter, N. N.
Journal of Food Protection 40 (1) 17-22 (1977) [24 ref. En] [Dep. of Food Sci., Cornell Univ., Ithaca, New York 14853, USA]

Production of haemolysin, phospholipase C, and (mouse) lethal toxin by 2 strains of B. cereus in beef, pea, and banana was assayed. Both strains produced haemolysin, phospholipase C, and lethal toxin in beef, haemolysin and phospholipase C in pea, and only lethal toxin in banana, although growth was excellent in each food. In each instance the metabolites were produced at characteristic levels for the food in which the organism was grown and the time of incubation. Foods containing these products were subjected to heating, refrigeration, and freezing. At 65°C, lethal toxin in beef was substantially inactivated in 3 min, but haemolysin and phospholipase C retained 50% of their activities after 30 min and about 13% after 120 min. Activity of the 3 substances in the different foods was decreased by approx. 50% at 4°C after 24 h, but in several instances was still substantially retained after 48 h. Freezing, holding at -37°C, and then thawing generally was less destructive of the activity of the 3 metabolites in the different foods although decreases of 50% or slightly more occurred in 48 h in most instances. Stability of the different metabolites was much the same with both strains of B. cereus. The influence of particular foods upon stability of haemolysin and phospholipase C was greater than upon lethal toxin. AS

45

Incidence of enterotoxin type E producing staphylococci of food, human and animal origin.
Dorsey, A. E.; Bennett, R. W.; Amos, W. T.
Abstracts of the Annual Meeting of the American Society for Microbiology 76, 189 (1976) [En] [FDA, Washington, DC, USA]

1698 staphylococcal isolates from food, human and animal sources were examined for production of staphylococcal enterotoxin type E to determine its frequency in relationship to the occurrence of enterotoxin types A, B, C and D in these sources. Culture fluids were produced employing the nursing bottle rotation technique, concentrated, and assayed for enterotoxin type E, utilizing the microslide gel diffusion test. Of the isolates of food origin (raw milk, frozen foods and foods incriminated in food poisoning outbreaks), 5 of 738 (0.67%) cultures produced type E enterotoxin. 1 of 181 (0.55%) isolates from suspected, acute or chronic cases of bovine mastitis produced this enterotoxin. Of human origin (nasal and clinical specimens), 5 of 779 (0.64%) cultures were enterotoxin type E producers. Of the 11 cultures producing enterotoxin type E, 7 produced it in combination with A, B, C, or D. The low incidence of type E producers compared to an incidence of 77.2% A, 12.2% B, 5.1% C and 23.7% D enterotoxin producers suggests that enterotoxin E would be less frequently associated with food poisoning outbreaks than the other serotypes. AS

46

Food-borne microorganisms of public health significance. Specialist course for the food industry. No. 6. Vol. II. Methods for the microbiological examination of food.
Australia, Commonwealth Scientific & Industrial Research Organization, Division of Food Research; **Australia**, Australian Institute of Food Science & Technology, Food Microbiology Group
Specialist Courses for the Food Industry, CSIRO 117pp. ISBN 0-9597441-2-6 (1976) [En] Kensington, NSW, Australia; School of Food Technology, University of New South Wales

Vol. II in this 2 volume manual [see preceding abstr. for Vol. I] contains detailed laboratory procedures for the detection, estimation and/or enumeration of food-borne microorganisms and toxins of public health significance. The procedures are identical to those being prepared by Committee AG/7 of the Standards Association of Australia (SAA) and, in part, have been published by the SAA as Australian Standard 1766 (Methods for the microbiological examination of food). This volume contains the following parts: General procedures and techniques (pp. 1.3-1.25); Examination for specific organisms (pp. 2-2.52); Preparation of samples for examination (pp. 4.1-4.16); and Preparation of media and reagents and descriptions of typical colonies and biochemical reactions (pp. 5-5.24). Draft methods for part 3 (Examination for specific products) had not reached sufficient detail to be included in this volume. JA

47

Staphylococci and their significance in foods. [Book]
Minor, T. E.; Marth, E. H.
xiv + 297pp. ISBN 0-444-41339-1 (1976) [many ref. En] Amsterdam, Netherlands; Elsevier Scientific Publishing Co. Price $35.50; F87.00 [Dep. of Preventive Med., Univ. of Wisconsin Cent.

for Health Sci. Madison, Wisconsin 53706, USA]

This book reviews relevant literature and deals specifically with characteristics of Staph. aureus and its enterotoxins, behaviour of staphylococci in foods, and epidemiology and control of staphylococcal intoxications. Chapters are: Some historical aspects of staphylococcal infections, intoxications, and classification (pp. 1-12, 54 ref.); Taxonomy and general description of the staphylococci (pp. 13-30, 81 ref.); Resistance of staphylococci to biological, and chemical agents in artificial environments (pp. 31-51, 56 ref.); Physiological characteristics suggested as indices of staphylococcal enterotoxigenicity (pp. 53-77, many ref.); Isolation and identification of staphylococci (pp. 79-98, 56 ref.); The staphylococcal enterotoxins: historical perspectives, description and properties, synthesis, and purification (pp. 99-125, 100 ref.); Analysis of staphylococcal enterotoxins in artificial media and in foods (pp. 127-157, 87 ref.); Pathogenesis and mode of action of the staphylococcal enterotoxins (pp. 159-174, 50 ref.); Source and transmission of enterotoxigenic staphylococci (pp. 175-194, 101 ref.); Behavior of staphylococci in dairy foods (pp. 195-217, 51 ref.); Behavior of staphylococci in meat, fish, and poultry products (pp. 219-234, 63 ref.); Behavior of staphylococci in cream-filled pastries and delicatessen foods (pp. 235-250, 40 ref.); Surveillance of staphylococcal food-borne intoxications (pp. 251-271, 14 ref.); and Control of staphylococcal food-borne intoxications (pp. 273-290, 8 ref.). JA

48

[Comparative evaluation of media for isolation and counts of coagulase-positive staphylococci in soft cheese.] Vergleichende Bewertung der Medien für die Isolation und Zahlung der koagulase-positiven Staphylokokken aus weissem Käse.

Takacs, J.

Alimenta 15 (6) 177-179 (1976) [6 ref. De] [Vet. Univ., Landler Jenö ucta 2, H-1078 Budapest, Hungary]

4 selective media for isolating and counting coagulase-positive staphylococci in cheese were compared with standard blood agar (BA) blood-salt-agar (BSA, 7.5% NaCl), Baird-Parker agar (ETGPA, laboratory prepared or purchased from Merck), and Giolitti-Cantoni semi-solid medium (GC). No significant differences were observed between statistical evaluations of the results obtained on the solid media and on control medium. BSA had the drawback of developing no colonies even after 48 h incubation, while typical colonies of Staphylococcus aureus developed on ETGPA within 24-48 h. Results on the GC medium differed significantly from the control; positive reaction was difficult to detect even after 48 h and had to be confirmed by subculturing on solid medium, adding another 24 h to the investigation. RM

49

Reliability of selective media for recovery of staphylococci from cheese.

Stiles, M. E.

Journal of Food Protection 40 (1) 11-16 (1977) [21 ref. En] [Foods & Nutr., Fac. of Home Economics, Univ. of Alberta, Edmonton, Alberta T6G 2M8, Canada]

The reliability of 12 selective media for recovery of 4 different strains of Staph. aureus inoculated at manufacture into 3 cheese types was determined. Selective medium and time of ripening had a highly significant effect ($P < 0.001$) on reliability of the staphylococcal count. In addition, highly significant interaction effects were observed. The most reliable medium in the overall analysis was mannitol salt agar. However, this medium was not equally reliable at all times during ripening, and use of both mannitol salt agar and Staphylococcus medium no. 110 is recommended. The tellurite- and azide-based selective media were generally unsatisfactory, and tellurite glycine agar, Vogel Johnson (VJ) agar, and azide blood agar base were totally unreliable. In general, the salt-based selective media were most reliable. This applied also to the egg yolk media that use salt as the selective agent. Salt egg yolk agar and Colbeck's egg yolk medium generally gave higher recoveries of Staph. aureus than did Baird-Parker medium, Crisley et al. tellurite polymyxin egg yolk agar, and Hopton egg yolk azide agar, except in the unripened cheeses. The debilitating effect of cheese ripening on the staphylococcal cells was not eliminated by the egg yolk tellurite and azide media. AS

50

[Influence of mastitis induced by staphylococcal enterotoxin on the fat content of cows' milk.]

Santos, E. C. dos; Moreira, H. A.

Arquivos da Escola de Veterinaria, Universidade Federal de Minas Gerais 28 (2) 181-187 (1976) [22 ref. Pt, en]

6-9 h after intramammary infusion of an aqueous solution of staphylococcal enterotoxin in 3 cows, the fat content of milk from the affected quarters was significantly ($P < 0.01$) lower than for normal quarters and there was an increase in pH and leucocyte counts. Milk fat content in affected quarters then rose to reach a max. after 24-48 h, whereas in normal quarters the highest levels of fat were measured in the first 24 h. After 96 h there were no significant differences in fat content between affected and normal quarters, although the affected quarters still gave a 3+ reaction in the CMT. The Milko-Tester MK II was used for determining the fat content in most cases, but the Gerber method was used for calibration and for samples of < 100 ml or samples with excessive mucus and clots. ADL

51

A modified RIA determination for staphylococcal enterotoxin B in food.
Pober, Z.; Silverman, G. J.
Abstracts of the Annual Meeting of the American Society for Microbiology 76, 188 (1976) [2 ref. En] [US Army Natick Development Cent., Natick, Massachusetts, USA]

Measurement of staphylococcal enterotoxin B (SEB), using solid phase radioimmunoassay, in milk and cheese slurry is limited to >2 ng due to the presence of proteins which immunologically react with rabbit anti-SEB with an equivalency of 2-10 ng. The activity of these proteins was minimized by a preconditioning step using either a cheese slurry or reconstituted dried skim-milk, thus permitting an increase in sensitivity to 0.5 ng in milk and 1.0 ng in a cheese extract. Polystyrene test tubes were incubated with antisera and then with bovine serum albumin (BSA). The tubes were then preconditioned in either a centrifuged cheese slurry (2:1 in 0.14M phosphate buffered saline i.e. PBS, pH 7.2) or reconstituted dried skim-milk (20 g/100 ml of the same PBS) for 16 h at 4° C. Samples of milk or heat-treated and chloroform-extracted cheese slurry [modified procedure of Reiser et al., FSTA (1974) 6 8C294] were incubated in the tubes for 6 h at 37° C. This was replaced by ^{125}I labeled SEB and incubated for a further 2-4 h. The assay for SEB in either cheese extract or milk can be accomplished in <12 h. AS

52

Effect of low temperatures on grown of Clostridium botulinum spores in meat of the blue crab.
Solomon, H. M.; Lynt, R. K.; Lilly, T., Jr.; Kautter, D. A.
Journal of Food Protection 40 (1) 5-7 (1977) [11 ref. En] [Div. of Microbiol., FDA, US Dep. of Health, Education & Welfare, Washington, DC 20204, USA]

The ability of unheated and heated spores of Cl. botulinum types B, E and F to grow and produce toxin in meat from the blue crab at low temp. was investigated. Sterilized meat was seeded with 10^3 unheated spores/g or 10^4 heated spores/g and incubated anaerobically at 4°, 8°, 12° and 26° C. Broth cultures served as controls. Unheated spores of all 3 types grew and produced toxin in meat at 26° C in 3 days. Unheated type E grew and produced toxin in meat at 12° C in 14 days but not at any lower temp. within 180 days. Unheated B and F did not grow or produce toxin at 12°, 8° or 4° C within 180 days in meat. Heated types B, E and F grew and produced toxin in meat at 26° C in 6 days but not at any of the lower temp. within 180 days. JA

53

Thermal destruction of Staphylococcus aureus 196E during frankfurter processing.
Palumbo, S. A.; Smith, J. L.; Kissinger, J. C.
Abstracts of the Annual Meeting of the American Society for Microbiology 76, 189 (1976) [En] [USDA, 600 E. Mermaid Lane, Philadelphia, Pennsylvania 19118, USA]

Standard frankfurter emulsion inoculated with Staph. aureus 196E was stuffed into casings and processed in a smokehouse according to a standard step-heating schedule. Samples of the frankfurters were removed at intervals and surviving staphylococci were counted. Heat injury was demonstrated only when large numbers of cells (5×10^8/g) were added and it was observed only within the temp. range 135-145° F. Heating of frankfurters to 160° F (the usual processing temp.) should ensure complete destruction of Staph. aureus present in the emulsion. Heat injury of Staph. aureus does not appear to be of public health significance in frankfurter processing. AS

54

[Effect of recipe composition of canned fish on germination and growth of Clostridium botulinum E.]
Skoczek, A.
Polskie Archiwum Weterynaryjne 19 (2) 357-374 (1976) [58 ref. Pl, ru, en] [Wojskowy Osrodek Naukowo-Badawczy Sluzby Weterynaryjnej, Poland]

Aqueous extracts (1:2) made in triplicate from 5-can contents of 31 varieties of commercial canned fish (28 of Polish and 3 of foreign manufacture) were heated to 100° C for 30 min, filtered, distributed at 10 ml into test tubes under paraffin wax and sterilized at 117° C for 30 min; 10^8 spores of strain 1163 of Cl. botulinum E (CE) from the collection of the State Institute of Hygiene (Warsaw, Poland) characterized by stable toxicogenicity were introduced into each test tube, and the test tubes were incubated at 30° C for 240 h, 13 samples being taken during this period for detn. of germination and growth of CE. Batches of 15 cans of each var. were also contaminated under sterility precautions with 10^8, 10^6 or 10^4 spores, held for 20 days at 30°, 20° or 10° C, cans with added sterile physiological salt solution serving as control, and inhibition or stimulation of CE growth and incidence of can blowing were assessed. Tests using similar variants of spore inoculum and incubation temp. were also carried out with selected can extracts. It is concluded from results tabulated or graphically presented mostly for (i)-(x) [see following abstr.] and discussed in detail that development of CE varied markedly with kind of canned fish. [Continued in following abstr.] SKK

55

[Effect of recipe composition of canned fish on germination and growth of Clostridium botulinum E.]
Skoczek, A.
Polskie Archiwum Weterynaryjne 19 (2) 357-374 (1976) [58 ref. Pl, ru, en] [Wojskowy Osrodek Naukowo-Badawczy Sluzby Weterynaryjnej, Poland]

[Continued from preceding abstr.] Greatest growth inhibition was shown by: (i) spiced mackerel salad, (ii) Gdansk fish salad, (iii) flounder in oil with paprika and onion, (iv) herring fillets in mustard sauce, and (v) mackerel fillets in Catalan sauce. Greatest growth stimulation was shown by: (vi) fish titbits in mustard mayonnaise, (vii) herring in tomato sauce, (viii) mackerel fillets in tomato sauce, (ix) flounder in tomato sauce, and (x) mackerel fillets in onion sauce. There was marked parallelism betweeen results with extracts and those with contaminated cans. Growth rate of CE was closely related to incubation temp. and to some extent to size of inoculum. [See FSTA (1974) **6** 8R421 & following abstr.]. SKK

56

[Effect of physico-chemical factors on germination and growth of Clostridium botulinum E in selected varieties of canned fish.]
Skoczek, A.
Polskie Archiwum Weterynaryjne **19** (2) 345-356 (1976) [40 ref. Pl, ru, en] [Wojskowy Osrodek Naukowo-Badawczy Sluzby Weterynaryjnej, Poland]

pH, oxidation-reduction potential, contents of total protein, free amino acids, reducing substances and free and unsaturated fatty acids were determined in the 5 var. of canned fish found to exert the greatest inhibitory effect on growth of Cl. botulinum E, and in the 5 var. found to exert the greatest stimulatory effect and described in the preceeding abstr. It is concluded from tabulated results that a positive oxidation-reduction potential and low pH were the 2 factors most closely connected with inhibition of germination and growth of Cl. botulinum. The other characteristics measured did not show any clear connection with Cl. botulinum activity. No constituent or group of constituents was found to be present in only 1 of the 2 groups of canned fish examined. SKK

57

Food poisoning and the skin.
Martin, C. R. A.
British Food Journal **79** (876) 18-19, 23 (1977) [En]

The long, hot summer of 1976 in the UK produced a steep rise in the number of cases of food poisoning caused by enterotoxigenic Staphylococcus aureus. The medical factors contributing to increased S. aureus populations on the skin are discussed, and the toxins produced by pathogenic strains, and methods of detection, are described. Since $\geqslant 40\%$ of the population are carriers of staphylococci, the importance of scrupulous hygiene amongst food handlers is very high; cleansing and hygiene precautions are briefly discussed. JRR

58

[Effect of freezing on the microflora of ready meals and minced meat.]
Lebert, F.; Rosset, R.
Bulletin de l'Academie Veterinaire de France **49** (3) 285-301 (1976) [5 ref. Fr] [Cent. d'Etudes & de Recherches pour l'Alimentation Collective, 5 Rue Mazet, 75006 Paris, France]

A prepared meal of beef tongue and carrots was examined bacteriologically before and after freezing at -18° C. 4 days after freezing, the number of pathogenic staphylococci, coliforms, Escherichia coli and Clostridia were significantly reduced. Freezing food samples before bacteriological examination can therefore lead to erroneous results. Minced beef artificially contaminated with E. coli and Staphylococcus aureus was frozen at -18° C for 48 h and subsequently stored at -18°, -12° or -6° C for 48 h or 50 days. Details of the survival of E. coli and Staph. aureus at the different storage temp. are given in 3 tables. With all samples examined, rapid thawing resulted in a higher survival rate for these 2 organisms. It is concluded that if a food has to be stored in the frozen state before analysis, it should be frozen rapidly to -18° C and kept at this temp. for < 1 month; thawing must be done as rapidly as possible and the sample suspension prepared immediately. MEG

59

Botulism. The organism, its toxins, the disease. [Book]
Smith, L. D.
xiii + 236pp. ISBN 0-398-03543-1 (1977) [many ref. En] Springfield, Illinois, USA; Charles C. Thomas Price $18.75 [Cent. for Disease Control, US Public Health Service, Atlanta, Georgia, USA]

This well-presented book, Publication No. 997 in the American Lecture Series, is a monograph in the Bannerstone division of American lectures in clinical microbiology, edited by A. Balows. It is intended for microbiologists, public health officials, food scientists, and all concerned with the occurrence of botulism. The chapters are: Introduction and history (pp. 3-14, 23 ref.); The organism (pp. 15-33, 52 ref.); The spores (pp. 34-63, 94 ref.); Bacteriophages, bacteriocins, and bacteriolysins (pp. 64-71, 27 ref.); Demonstration and isolation (pp. 72-90, 45 ref.); The occurrence of Clostridium botulinum (pp. 91-112, many ref.); The toxins of Clostridium botulinum (pp. 113-141, many ref.); The action of the toxins (pp. 142-151, 46 ref.); Botulinum toxoids (pp. 152-156, 12 ref.); Botulism in man - its occurrence (pp. 157-176, 29 ref.); Botulism in man - the disease (pp. 177-193, 51 ref.); Botulism in animals (pp. 194-214, 76 ref.); and Botulism in birds (pp. 215-230, 43 ref.). A 6-pp. subject index is included. DIH

60

[Microorganisms responsible for food poisoning.]
Anon.
Revue de la Conserve Alimentation Moderne No. 49, 149-152 (1976) [Fr]

The general characteristics of salmonellae, staphylococci, Clostridium welchii (or C. perfringens), C. botulinum and a few other minor organisms are discussed from the viewpoint of their significance in food poisoning. Brief information is also given on hygienic control in the food industry. HBr

61

[An investigation of the occurrence of staphylococci in raw milk.]
Bijker, P. G. H.; Mol, H.; Vincentie, H. M.
Tijdschrift voor Diergeneeskunde 101 (7) 365-371 (1976) [37 ref. Nl, en] [Vakgroep Voedingsmiddelen van Dierlijke Oorsprong, Fac. Diergeneeskunde, Biltstraat 172, Utrecht, Netherlands]

200 samples of can milk collected from 40 farms in the Utrecht district of the Netherlands during April 1975 were tested for Staphylococcus aureus, using Baird-Parker medium. The cultures obtained were phage-typed with international, bovine and Dutch phage series. Approx. 60% of the strains were of human and 20% of bovine origin. The strains appeared to be farm-specific. About 70% of the farms supplied bulk milk containing 800-12 800 coagulase- and DNAase-positive staphylococci/ml. Of 1215 strains tested, 832 were positive both for coagulase and for DNAase, 127 were positive for DNAase but negative for coagulase, one was positive for coagulase but negative for DNAase, and 255 were negative for both enzymes. In view of the high proportion of human strains it is concluded that milk presents a latent danger to public health if sold or manufactured without pasteurization. ADL

62

Methods of microbiological examination of dairy products and for dairy purposes. III. Methods for the detection of specific groups of micro-organisms. Section II. Coagulase-positive staphylococci.
Australia, Standards Association of Autralia
Australian Standard AS 1095.3.2-1976, 4pp. (1976) [En] [80 Arthur Street, N. Sydney, NSW, Australia]

2 methods are described, viz. the spread method and enrichment method, as well as procedure for the slide coagulase test for confirmation. AL

63

[Prevention of food infection and poisoning.]
[Review]
Matyas, Z.; Kocot, M.
Medycyna Weterynaryjna 33 (1) 1-5 (1977) [13 ref. Pl]

This review deals with classification of infections of food origin, and their control (laboratory tests, notification, study of outbreaks, medical examination of people involved in food production and sale, control at the production stage, and control at the distribution stage). SKK

64

Elimination of non-specific hemagglutination interfering in the detection of staphylococcal enterotoxins by reverse passive hemagglutination.
Kuo, J. K.; Genigeorgis, C.
Abstracts of the Annual Meeting of the American Society for Microbiology 77, 260 (1977) [En] [Univ. of California Vet. School, Davis, California, USA]

A non-specific haemagglutinin (NSH) which can agglutinate formalized sheep red blood cells (SRBC) coated with antibody to enterotoxin B has been found in cultures of many S. aureus strains not producing enterotoxin B. This was observed also when SRBC were coated with antienterotoxin C and tested against supernates of strains not producing enterotoxin C. Affinity chromatography based on purified IgG type B or C did not eliminate the problem and the NSH could be recovered in the eluates. When the specific B and C antibodies were treated with pepsin, and the resulting $F(ab')_2$ fragments were purified by Sephadex G-200 and then coupled to Sepharose-4B, the latter matrix showed no affinity toward the NSH. Furthermore, SRBC coated with type B or C $F(ab')_2$ were not agglutinated by culture supernates other than those containing the same type of enterotoxin. When supernate of nonenterotoxigenic strain Wood 46 was passed through Sepharose coupled to type B IgG or $F(ab')_2$ or uncoupled Sepharose the eluates from the column with the IgG antibody contained 4× more protein than the other 2 eluates. The findings suggest that NSH present in most S. aureus cultures is a heat resistant protein which can react with the Fc Portion of IgG antibody, but differs from protein A on the basis of its heat resistance and trypsin insensitivity. AS

65

A modified radioimmunoassay for Staphylococcus aureus enterotoxins utilizing S. aureus serotype 1.
Metzger, J. F.; Johnson, A. D.
Abstracts of the Annual Meeting of the American Society for Microbiology 77, 259 (1977) [En] [US Army Med. Res. Inst., Fredrick, Maryland, USA]

A radioimmunoassay was developed utilizing the γ-globulin-precipitating property of formalin-fixed S. aureus serotype 1 (SaCl). This procedure permitted the utilization of whole antisera to enterotoxins A, B, and C without purification of the golobulin fraction or attachment to a solid phase moiety. Labelled enterotoxins, in which >95% of the radioactivity was precipitated by specific antibody, were prepared by a gaseous diffusion method using ^{125}I. Appropriate dilutions of antiserum were determined by titration with 50-100 ng of labelled

enterotoxin and that dilution which precipitated 40-60% was considered optimum. The test consisted of antiserum, labelled enterotoxin and standard or test sample in final vol. of 1-2 ml. Tests were incubated 24 h at 4°C and then 0.1 ml of a 10% suspension of SaCl was added. The tubes were mixed thoroughly and then centrifuged at 2000 × g for 10 min. The supernatant was removed by decanting and draining on absorbant paper and the pellet in the tube was read in a gamma counter. Quantitation obtained from a standard curve gave values accurate to 10% with a sensitivity of 10 ng. All reagents are stable indefinitely except the labelled enterotoxin which can be used for 2-4 months. AS

66

Detection of enterotoxin in faeces and anti-enterotoxin in serum after Clostridium perfringens food-poisoning.
Skjelkvale, R.; Uemura, T.
Journal of Applied Bacteriology 42 (2) 355-363 (1977) [21 ref. En] [Norwegian Food Res. Inst., PO Box 50, N-1432 As-NLH, Norway]

2 outbreaks of Clostridium perfringens food poisoning (both affecting the same person) are described. The bacteria present in the suspect foods and faeces samples were studied by microscopy and culture on TSN agar; their serological and biochemical characteristics were evaluated. Faeces and serum samples were tested for enterotoxins by immunodiffusion and electrophoretic techniques. Suspect food samples contained $\leq 5.1 \times 10^7$ Cl. perfringens/g before heat-shocking, $\leq 1.2 \times 10^4$/g after heat-shocking. It is suggested that detn. of enterotoxin in the faeces may be of potential use for diagnosis of Cl. perfringens food poisoning. AJDW

67

[Detection of Bacillus cereus.]
Fonden, R.
Livsmedelsteknik 16 (8) 346-348 (1974) [14 ref. Sv] [Mjolkcent., Stockholm, Sweden]

Samples of dairy products (ice cream, cream, skim-milk concentrate, dried milk and whey products) were tested for B. cereus by the following 3 methods: (i) the method prescribed in 1968 by the Nordic Methods Committee for Foodstuffs, in which B. cereus is detected on blood agar by incubation for 24 h at 37°C and subsequent counting of haemolytic colonies of characteristic appearance; (ii) the method of Mossel et al., in which B. cereus is detected by incubation at 30°C for up to 42 h on mannitol-egg yolk agar with polymyxin and subsequent counting of characteristic colonies that do not ferment mannitol but precipitate egg yolk; and (iii) the method of Kim & Goepfert [FSTA (1971) 3 9B75]. B. cereus was detected in 95 samples by one or more of these methods. Of the 95 samples, 92% were positive in method (i), 62% in (ii) and 68% in (iii). There were no problems due to growth of interfering bacteria, as the samples had been recently pasteurized and had low total bacterial counts (mostly between 100 and 100 000/ml). It is concluded that in such samples the B. cereus count can be determined by the following 2-step procedure: streaking-out on blood agar by method (i); confirmation by streaking-out suspected positive colonies on Kim & Goepfert's medium, with incubation for 24 h at 35°C and microscopic examination. ADL

68

An investigation of the bacteriological quality of retail vanilla slices.
Pinegar, J. A.; Buxton, J. D.
Journal of Hygiene 78 (3) 387-394 (1977) [24 ref. En] [Public Health Lab., Leeds, UK]

133 vanilla slices, purchased from shops in the West Yorkshire Metropolitan County, UK, were examined to determine numbers and types of bacteria present at the time of purchase. The surface colony count at 37°C was $> 10^3$/g in 67 of the 133 samples examined. Bacillus cereus being found at that concn. in 21.8%, coliform bacilli including Escherichia coli in 5.3%, Staphylococcus aureus in 3.0% and Streptococcus faecalis in 0.8%. 34 strains of B. cereus were serotyped and 11 (32%) of these were typable with the sera available. Preparation of custard mixes in the laboratory suggests that the milk or dried milk used in the mix may be the major source of B. cereus in the final product. Many of the present methods of manufacture, distribution and storage allow organisms present in the custard at manufacture the opportunity to multiply and possibly reach numbers which present a risk of food poisoning. AS

69

Enterotoxigenic staphylococci in goat meat.
Panduranga Rao, C. C.
Journal of Food Science and Technology, India 13 (5) 264-265 (1976) [16 ref. En] [Indian Vet. Res. Inst., Izatnagar, Uttar Pradesh, India]

127 samples of goat meat were examined for coagulase-positive staphylococci using 10% NaCl broth for enrichment followed by surface streaking on ETGPA medium of Baird-Parker. 12 of the samples (9.45%) revealed coagulase-positive isolates, which were then examined fo enterotoxigenicity employing cellophane over agar and immuno-diffusion on microslides. 7 of the isolates were found to be enterotoxigenic; 6 preduced enterotoxin C and 1 enterotoxin D. Enterotoxigenic staphylococci from goat meat are reported for the first time in India. AS

70

A comparative study on the properties of enterotoxigenic staphylococci isolated from humans and food.
Chan, L.
Dissertation Abstracts International, B 37 (4) 1553: Order No. 76-22178 (1976) [En] [Univ. of California, Los Angeles, California, USA]

A study was made of the biochemical and physiological properties of Staphylococcus aureus S-6 and of staphylococci producing enterotoxin B isolated from healthy individuals and hospital patients. One aim of the study was to establish whether these organisms share any traits unique to enterotoxigenic strains other than enterotoxin B production; no such traits were found. Further studies examined enterotoxin synthesis, growth kinetics and pH changes in media differing in glucose content. The presence of glucose generally increased the growth rate while the onset and rate of enterotoxin synthesis were inversely related to glucose concn. JA

71

Modified radioimmunoassay determination for staphylococcal enterotoxin B in foods.
Pober, Z.; Silverman, G. J.
Applied and Environmental Microbiology 33 (3) 620-625 (1977) [14 ref. En] [Food Sci. Lab., US Army Natick Res. & Development Command, Natick, Massachusetts 01760, USA]

The sensitivity of solid-phase radioimmunoassay for the measurement of staphylococcal enterotoxin B (SEB) in foods was decreased by food constituents that react with rabbit anti-SEB with an equivalency of >2 ng/ml. This activity was minimized by a conditioning step for anti-SEB and by removal of interfering compounds in the sample by extraction. Polystyrene test tubes were initially incubated with antisera and then with bovine serum albumin. The tubes were then conditioned with either a centrifuged aqueous cheese extract or reconstituted dried skim-milk for 16 h at 4° C. Samples of milk or heat-treated and $CHCl_3$-extracted cheese or chicken salad slurries were incubated in the assay tubes for 6 h at 37° C. The samples were replaced by ^{125}I-labelled SEB and incubated for a further 2-4 h before the contents were removed and the tubes were washed and counted. A buffer solution containing known concn. of toxin served as standard for assaying SEB in the food extracts. The entire assay can be accomplished within 24 h with a sensitivity of 1 ng/ml in milk and in the cheese extract or 1.3 ng/ml in the chicken salad extract. AS

72

Significance of Clostridium perfringens in processed foods. [Review]
Fruin, J. T.
Journal of Food Protection 40 (5) 330-332 (1977) [16 ref. En] [Food Hygiene Div., Dep. of Nutr., Letterman Army Inst. of Res., Presidio of San Francisco, California 94129, USA]

Clostridium perfringens presents a significant public health hazard to consumers of foods which have undergone improper processing or have been improperly handled at some point before consumption. Factors involved in outbreaks of C. perfringens foodborne illness include contamination of food with either spores or vegetative cells of enterotoxigenic strains of C. perfringens, suitable growth temp., pH, media, oxidation/reduction potential, and adequate incubation time. With proper handling of food items, the risk of C. perfringens foodborne illness outbreaks can be eliminated. AS

73

[Hazard of Clostridium botulinum development in canned foods containing paprika.]
Prokhorovich, L. F.; Shenderovskaya, T. M.; Saltykova, L. A.; Klepa, N. F.
Konservnaya i Ovoshchesushil'naya Promyshlennost' No. 12, 33-35 (1976) [Ru] [Moldavskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

The potential hazard of development and toxin formation by Clostridium botulinum was studied for canned paprika filled with vegetables and rice with tomato sauce, and paprika fillets with vegetables and rice with tomato sauce, etc. The paprika-containing foods had a pH of 4.0-5.0. Perfectly sterilized samples were artificially contaminated with Cl. botulinum spore suspensions using strains A-87 and B-225 having notorious high resistance to heat and acidity. The suspension count was 3.5×10^6 spores/ml. An anaerobic environment for the contaminated homogenized sample was created by a paraffin seal. The samples were kept with thermostat control at 35° C for 12 months, with monthly checks on appearance, pH, clostridium count, formation of botulotoxin and its activity. With 'lecho' food (a mixture of paprika, tomatoes, eggs, sausage and other ingredients) having pH 4.2-4.6 an intensive development of Cl. botulinum and botulotoxin formation was observed after 5-6 months, plus gas formation and changes of product colour and a 0.2-0.4 rise in pH. Biological activity of the toxin reached 1000× min. lethal dose in some samples. 'Lecho' samples with pH of 4.0 contained approx. the same count of bacteria as at the start of the experiment, with no toxin. Addition of 0.5% glucose, 0.5% yeast autolysate and 0.15% ascorbic acid (the autolysate being favourable for clostridium development) had no positive results. Detailed data on Cl. botulinum development are tabulated. STI

74

Type B botulism outbreak caused by a commercial food product. West Virginia and Pennsylvania, 1973.
Barker, W. H., Jr.; Weissman, J. B.; Dowell, V. R., Jr.; Gutmann, L.; Kautter, D. A.
Journal of the American Medical Association 237 (5) 456-459 (1977) [15 ref. En] [Enteric Disease Branch, Bureau of Epidemiology, Cent. for Disease Control, Atlanta, Georgia 30333, USA]

This communication reports in detail the investigation of an outbreak of type B botulism which affected 7 persons who had eaten together at a

family home near Pittsburgh (Pennsylvania, USA) in May 1973. All those affected were treated with trivalent botulinal antitoxin, and none died. Symptoms were distinctly milder than those generally reported in cases of botulism; reasons for this are discussed. Serum specimens from the 7 patients were negative for botulinal toxin, but stool specimens from 3 were positive for type B toxin. Analysis of foods consumed by the patients revealed the presence of type B toxin in commercially canned hot peppers. Before canning, the peppers had been boiled in water for approx. 30 min and then fried in oil; the pepper were not acidified and their pH was in the range 4.41-5.54. The processor voluntarily recalled the product from retailers and no further outbreaks of botulism were reported. Canning operations were discontinued at the plant until safe practices were established. JA

75

[Enteropathogenic Staphylococcus aureus in pasta.]
Delazari, I.; Leitao, M. F. F.
Coletanea do Instituto de Tecnologia de Alimentos 7 (2) 485-497 (1976) [51 ref. Pt, en] [Inst. de Tecnologia de Alimentos, Av. Brasil 2880, Caixa Postal 139, Campinas, Sao Paolo, Brazil]

120 samples of commercially-produced pasta were tested for Staph. aureus and its enterotoxins. 89 samples (69.5%) contained Staph. aureus; 14% had counts $> 10^4$/g. Egg pasta was more frequently contaminated than pasta without egg. A total of 327 isolates of Staph. aureus were tested for coagulase and heat-stable deoxyribonucleotidase activity; 232 isolates were coagulase-positive, and 228 were heat-stable DNAase-positive. Correlation between incidence of coagulase and DNAase activities was 89.9%. 102 coagulase- and DNAase-positive isolates were tested for enterotoxin formation; 31.1% formed type A, 7.5% formed type B, 4.7% formed both types A and B, 3.7% formed type C, 12.2% formed type D, and 3.7% formed type E. Studies on detn. of Staph. aureus in macaroni showed that direct plating on Baird-Parker medium gave higher counts than an MPN method with pre-enrichment in tryptone soy broth + 10% NaCl. AJDW

76

Detection and enumeration of coagulase positive staphylococci in dairy products. III. Evaluation of the performance of the strip method.
Ibrahim, G. F.
Australian Journal of Dairy Technology 32 (1) 35-38 (1977) [28 ref. En] [Dairy Res. Cent., Dep. of Agric., Richmond, NSW, Australia]

664 samples comprising pasteurized milk, Cheddar cheese, soft cheeses, salted butter and dried milk were examined using the diagnostic paper strip method of Ibrahim [FSTA (1977) 9 3P509] and Baird-Parker medium. The strip method compared favourably with Baird-Parker medium and it could detect egg yolk-positive and egg yolk-negative strains of coagulase-positive staphylococci. Reliance on the egg yolk reaction alone for the diagnosis of coagulase-positive staphylococci is considered inadequate. When phenolphthalein diphosphate was added to the complete medium of Baird-Parker at the rate of 0.01% (w/v), egg yolk-negative coagulase-positive staphylococci were detected by their phosphatase activity after exposure to ammonia vapour. [See FSTA (1977) 9 7P1105 for part II.] AS

77

[Hygie..ic quality of the Swiss cheese Vacherin Mont-d'Or.]
Musson, A.
Lait 57 (565-566) 271-277 (1977) [Fr, en] [Lab. Cantonal, Epalinges, Switzerland]

In 1974, 6% of bulk milks from 52 dairies manufacturing Vacherin Mont-d'Or cheese contained > 100 000 staphylococci/ml (with a max. of 200 000/ml) and 14% of the ripening cheeses contained > 1 million/g. In 1975, 21% of the bulk milks exceeded 5000 staphylococci/ml, with a max. of 31 000/ml, and 6% of the cheeses exceeded 1 million/g. Finally, in 1976, 20% of the bulk milks had > 1000 staphylococci/ml, with a max. of only 5000/ml, and none of the cheeses had counts above 1 million/g. Of 16 strains isolated from the cheese and milk, 13 were identified as Staphylococcus epidermidis biotype 1 (coagulase-positive). The ability of the strains to produce enterotoxins was investigated, as toxin D (up to 32 ppm) has recently been found in Vacherin cheeses suspected of causing food poisoning. ADL

78

Growth and enterotoxin production by staphylococci in Genoa salami.
Lee, I. C.; Harmon, L. G.; Price, J. F.
Journal of Food Protection 40 (5) 325-329 (1977) [13 ref. En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., East Lansing, Michigan 48824, USA]

Staphylococcus aureus strains 265 and 243 which produce enterotoxins A and B, respectively, were inoculated into meat being made into Genoa salami in the amount of 10^3, 10^5, and 10^7 cells/g. No lactic starter culture was added. Samples were taken at different stages of processing to determine the microbial populations, % moisture, total acidity, pH, and enterotoxin content. Staphylococcal populations varying from about 10^7 to 5×10^3/g were detected during tempering of the salami. Enterotoxin A was detected in surface but not in core samples of salami inoculated with 10^5 and 10^7 S. aureus 265 cells/g. However, no enterotoxin B was detected in the salami inoculated with S. aureus 243, which requires a relatively high water activity for enterotoxin production. Staphylococcal counts were higher in surface samples than in core samples which was attributable to the difference in oxygen tension, but there was no significant difference in microaerophilic lactic acid bacteria in different portions of salami. AS

79

Collaborative study of a method for the detection of Clostridium botulinum and its toxins in foods.
Kautter, D. A.; Solomon, H. M.
Journal of the Association of Official Analytical Chemists **60** (3) 541-545 (1977) [2 ref. En] [Div. of Microbiol., FDA, Washington, DC 20204, USA]

The mouse toxicity and protection technique for the detection and identification of Clostridium botulinum and its toxins in foods was collaboratively studied by 11 laboratories. Each laboratory received 4 samples of cream of mushroom soup; 2 contained spores and toxin of C. botulinum type A, 1 contained spores and toxin of C. botulinum type E, and 1 contained spores of C. sporogenes. The media used were cooked meat medium (beef heart or chopped liver broth) and trypticase peptone glucose yeast extract broth with trypsin. The results indicate that this method has a high degree of repeatability and reproducibility. All 11 laboratories correctly identified the toxins and the nontoxic sample in the food and detected and identified the viable spores in the samples by means of the subsequent cultures. This method has been adopted as official first action. AS

80

Hospital outbreak of Clostridium perfringens food-poisoning.
Thomas, M.; Noah, N. D.; Male, G. E.; Stringer, M. F.; Kendall, M.; Gilbert, R. J.; Jones, P. H.; Phillips, K. D.
Lancet **1** (8020) 1046-1048 (1977) [16 ref. En] [Epidemiological Res. Lab., Cent. Public Health Lab., Colindale Avenue, London NW9 5HT, UK]

An outbreak of Clostridium perfringens food poisoning (affecting 379 patients, one of whom died) at a large hospital is described. A minced ham product was identified as the source of infection; 78% of patients consuming this product were infected. Clostridium perfringens type A serotype 1 was isolated from patients and food scraps; a new serotype (61) was isolated from patients. The methods used for preparation of the minced ham product are described. It is concluded that the hams were too large (5.5 kg each) for acceptably rapid cooking and cooling; the delay between cooking and refrigeration exceeded the max. safe period of 1.5 h; and the cooked meat was minced in machines used for raw meat. The food preparation premises were dilapidated; supervision was inadequate. It is proposed that the Food Hygiene Regulations should be made applicable to National Health Service hospitals. AJDW

81

Staphylococcal enterotoxins and food poisoning. Production, properties and detection of enterotoxins. [Review]
Niskanen, A.
Publication, Technical Research Centre of Finland, Materials and Processing Technology No. 19, 83pp. (1977) [364 ref. En] [Food Res. Lab., Tech. Res. Cent. of Finland, Helsinki, Finland]

This report is divided into 2 parts, a review of the literature (pp. 11-53) and a summary of 7 papers published elsewhere by the author. The review covers the following topics: properties of Staphylococcus aureus; description and properties of the enterotoxins; production of enterotoxins; epidemiological considerations, including types of food involved, sites of mishandling of food and conditions required for an outbreak of staphylococcal food poisoning; clinical symptoms; prevention of staphylococcal food poisoning; methods for detection of enterotoxins, bioassay and serological methods; detection of enterotoxins in foods; and indirect screening for enterotoxin by detn. of thermonuclease. The author's work reported includes a correlation of enterotoxin and thermonuclease production with properties of S. aureus strains isolated from (i) routine food sampling, (ii) food poisoning outbreaks and (iii) mastitis milk. 51% of the total produced enterotoxin A. 51% of (i) were toxin producers, as were 80% of (ii), and 41% of (iii). All strains produced thermonuclease. Also reported are the preparation of ^{125}I- and ^{131}I-labelled enterotoxin A; the use of labelled enterotoxins in the development of extraction procedures; and the suitability of the ^{125}I-labelled enterotoxin for double antibody solid-phase radioimmunoassay which can detect 2-5 ng enterotoxin A/ml minced meat or sausage extracts. DIH

82

Production of Bacillus cereus enterotoxin in defined media in fermenter-grown cultures.
Glatz, B. A.; Goepfert, J. M.
Journal of Food Protection **40** (7) 472-474 (1977) [7 ref. En] [Food Res. Inst., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Enterotoxin, measured in capillary permeability factor (CPF) units, was produced by cultures of Bacillus cereus growing in defined media containing glucose, basal salts, and amino acids under controlled conditions in a small fermenter. No enterotoxin was detected in shake flask cultures. AS

83

[Contamination of slaughtered poultry with pathogenic staphylococci during handling.]
Georgiev, L.; Zakhariev, Ts.; Bail'ozov, D.
Veterinarnomeditsinski Nauki **14** (2) 3-7 (1977) [17 ref. Bg, ru, en] [Vissh. Inst. po Zootekh. i Vet. Med., Stara Zagora, Bulgaria]

Swab samples were taken in 2 poultry slaughterhouses from groups of 15 or 25 birds at the following stages: before slaughter, before and after scalding, before and after singeing, before and after evisceration, and before and after water cooling (205 birds in all). Further samples were taken from cooling water from 2 tanks; and from nose and of rinsings from uninjured and injured hands of workers. Numbers and incidences of samples contaminated with pathogenic

staphylococci and of (i) Staph. aureus and (ii) Staph. epidermidis contaminations are tabulated for each step. Overall 881 strains were isolated consisting of 43.3% (i) and 56.7% (ii). Cooling water and injured hands of workers on the slaughter line are considered the main sources of contamination. SKK

84

The Limulus lysate endotoxin assay as a test of microbial quality of ground beef.
Jay, J. M.
Journal of Applied Bacteriology 43 (1) 99-109 (1977) [14 ref. En] [Dep. of Biol., Wayne State Univ., Detroit, Michigan 48202, USA]

The Limulus lysate test (LLT) for endotoxin assay has been found to be an excellent simple and rapid test of microbial quality of refrigerated ground beef. In fresh ground beef held at 5° C for 7-12 days, LLT titres increased from 10^2 to 10^5 and correlated very highly with exact-release vol. (ERV) data and total viable Gram negative counts at both 5° and 30° C. The LLT was negative for fresh beef containing low numbers of bacteria and on aged beef in the absence of increasing numbers of Gram negative bacteria. Of 14 Gram negative meat isolates, all gave a positive LLT while none of eight miscellaneous Gram positive bacteria did. The use of this test provides objective information on the microbial quality of fresh refrigerated ground meats in 1 h. Based upon this study, it is suggested that a 0.1 ml inoculum from a 10^3 dilution of good quality ground beef should produce a negative lysate test and thus serve as an additional rapid screening test of meat microbial quality. AS

85

Role of nitrite and ascorbate in the microbiological safety of vacuum-packed sliced bacon. (In 'Proceedings of the Second International Symposium on Nitrite in Meat Products' [see FSTA (1977) 9 12S2047].) [Lecture]
Crowther, J. S.; Holbrook, R.; Baird-Parker, A. C.; Austin, B. L.
pp. 13-20 (1977) [En] [Unilever Res., Sharnbrook, Bedford, UK]

Studies on effects of NaCl, nitrate, nitrite and ascorbate concn. on growth and toxin formation by Clostridium botulinum and Staphylococcus aureus inoculated into vacuum-packaged bacon are described. Bacon samples studied contained 4 or 5.5% NaCl, 0, 1000 or 2000 mg ascorbate/kg, 0, 100 or 200 mg nitrite/kg, and 0 or 250 mg nitrate/kg. Packs for studies on Cl. botulinum were held at 25° or 30° C for ≤ 28 days; open and sealed packs for studies on Staph. aureus were held at 15° or 25° C for ≤ 28 days. Tables of results are given. Mildly-salted bacon (4% NaCl) readily supported botulinum toxin formation in the absence of nitrate or nitrite; addition of 100 mg/kg nitrite + 250 mg/kg nitrate reduced botulinum toxin formation, and 200 mg nitrite/kg gave increased protection against botulinum toxin formation. Bacon containing 5.5% NaCl did not readily support toxin formation; however, treatment effects showed similar trends to those observed in the mildly-salted bacon. At both NaCl concn., toxin formation was greater at 30° than at 25° C. Sodium ascorbate did not adversely influence the activity of nitrite against Cl. botulinum; addition of 1000 or 2000 mg ascorbate/kg enhanced the activity of nitrite added at 100 mg/kg. Omission of nitrite and nitrate increased the risk of toxin formation by factors of 20 for medium-salted and 440 for mildly-salted bacon. Growth and toxin formation by Staph. aureus were not significantly affected by nitrate, nitrite or ascorbate; however, vacuum-packaging prevented enterotoxin formation. AJDW

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